



Nunes Vieira, L. (2020). Automation anxiety and translators.
Translation Studies, 13(1), 1-21.
<https://doi.org/10.1080/14781700.2018.1543613>

Publisher's PDF, also known as Version of record

License (if available):
CC BY

Link to published version (if available):
[10.1080/14781700.2018.1543613](https://doi.org/10.1080/14781700.2018.1543613)

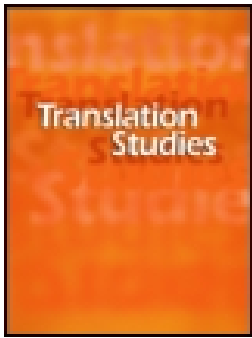
[Link to publication record in Explore Bristol Research](#)
PDF-document

This is the final published version of the article (version of record). It first appeared online via Taylor & Francis at <https://www.tandfonline.com/doi/full/10.1080/14781700.2018.1543613> . Please refer to any applicable terms of use of the publisher.

University of Bristol - Explore Bristol Research

General rights

This document is made available in accordance with publisher policies. Please cite only the published version using the reference above. Full terms of use are available:
<http://www.bristol.ac.uk/red/research-policy/pure/user-guides/ebr-terms/>



Automation anxiety and translators

Lucas Nunes Vieira

To cite this article: Lucas Nunes Vieira (2018): Automation anxiety and translators, Translation Studies, DOI: [10.1080/14781700.2018.1543613](https://doi.org/10.1080/14781700.2018.1543613)

To link to this article: <https://doi.org/10.1080/14781700.2018.1543613>



© 2018 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 29 Nov 2018.



Submit your article to this journal [↗](#)



View Crossmark data [↗](#)

Automation anxiety and translators

Lucas Nunes Vieira 

School of Modern Languages, University of Bristol, Bristol, UK

ABSTRACT

Translation is currently described as a profession under pressure from automation, falling prices and globalized competition. Translators' stance on machine translation (MT) is famously negative, but the economic dimension of this positioning is scarcely researched and often unclear. This article provides an analysis of translators' blog and forum postings contextualized within general trends in employment, the economy and work automation. The analysis concentrates on MT and pay. Two key findings are reported. First, MT was found to be a secondary issue in translators' comments on pay; most grievances were based on business practices themselves. Second, most criticisms of MT were rooted not in fears of being outperformed by MT systems, but rather in the technology's limitations and market consequences. This article calls for a broadening of translators' role across areas of specialization and argues that, in the debate on translation's future, MT cannot be decoupled from its economic effects.

KEYWORDS

Work automation; translators; machine translation; translation rates; translation technology

Introduction

Advances in machine translation (MT) technology and the reverberations of the 2008 financial crisis have led to perceptions of translation as a profession under pressure from automation, falling prices and globalized competition: translators are said to “have the blues” (Johnson 2017). The ways in which technology may affect translation and its future have been the object of much scholarly work of late (e.g. Alonso and Vieira 2017; Baumgarten and Cornella-Detrell 2017; Cronin 2013; Mitchell and Raley 2018; Moorkens 2017). Research on professional translation has also examined translators' evaluation of processes, technology and working models (e.g. Flanagan 2016; Guerberof 2013; Meijer 1993; Olohan 2011). However, previous research on translators' attitude to automation focuses predominantly on how technology affects translation processes and products (e.g. Cadwell, O'Brien, and Teixeira 2018), with little emphasis on how translators perceive the economic reverberations of technology. It has been suggested that business practices may be a more critical issue for translators than technology itself (LeBlanc 2017), but translators' discourse on the connections between MT and its market and economic effects has to date received little attention. Failing to fully grasp translators' perspective on these issues leaves open important questions that are integral

CONTACT Lucas Nunes Vieira  l.nunesvieira@bristol.ac.uk

© 2018 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

to a productive coexistence of humans and machines in the provision of translation services.

Furthermore, much of the recent debate on translators' outlook does not address the fact that the various developments currently facing translators are part of wider trends that may affect human labor as a whole. Approaches to the topic that fail to consider this wider context risk missing important phenomena – including trends that have been under way prior to the 2008 financial crisis – which in turn has consequences for how automation threats are discussed and understood.

This article therefore provides an analysis of translators' discourse which is contextualized in relation to general employment trends and empirical data on the translation industry. The discussion draws on the work automation literature and data from government sources and professional surveys. Translators' views are examined using corpus-linguistics methods and a qualitative analysis of forum and blog postings. The article argues that in the short to medium term automation is not a danger to the profession. A reconsideration of certain approaches to automation is proposed.

While I discuss professional contexts that concern non-literary translators more directly, I make no distinction between literary and non-literary sectors of the translation market. The study does not set out to deal with interpreting, however. Although some of the government data cited in the article often merges translators and interpreters into a single occupational category, it is beyond the scope of the study to provide a detailed discussion pertaining specifically to interpreters.

The article is structured as follows. First, it reviews general economic and automation trends and how these trends may affect translation. It then presents an analysis of translators' discourse regarding the incidence and nature of topics like pay and machine translation. Finally, the conclusion focuses on important aspects to consider in the debate on translation's future.

Work automation trends and translation

Economic growth, the second machine age and job polarization

Fears of technological disruption are not a new phenomenon. A famous historical event usually associated with these fears was the Luddite riots in 1811–1816, when British workers destroyed textile machinery in a protest against mechanization and poor working conditions. There are also records of much earlier events where the disruptive power of technology faced resistance. As early as the sixteenth century, for example, Queen Elizabeth I denied patent protection for a knitting machine because of its potentially disruptive effects on the working population.¹

Despite these historical fears, technology tends to replace specific tasks rather than entire occupations (Autor 2015, 26). This is because in many cases occupations involve activities that rely on internalized tacit knowledge that we cannot easily define or explicate. This is often referred to as *Polanyi's paradox* (Autor 2014). This paradox would make high-quality automation achievable only in the context of repetitive tasks whose procedures can be explicitly stated and, for this reason, easily programmable – for instance, doing repetitive calculations on a spreadsheet. In translation, certain aspects of working with texts from technical domains have now been automated by computer-assisted

translation (CAT) tools such as SDL Trados Studio or memoQ. These tools automatically search previously translated content and allow translators to recycle fragments or segments from other translations thanks to the use of translation memories. While these tools also include MT output as a feature that can be used in the translation process, as the name suggests they assist rather than replace human translators. Users of these tools are still in charge of translating from scratch where required as well as editing and interacting with suggestions from MT systems and/or translation memories, among other tasks.

The fact that in most scenarios only certain aspects of translators' work can be automated seems in line with the view that in many cases just specific tasks within an occupation are likely to be automated. However, the advent of machine learning – a method where machines “learn” patterns from data – dispenses with the need for providing the computer with explicit rules. This has recently put much of the constraining power of Polanyi's paradox into question. Machine learning is of direct interest to translators. This method underlies most of today's MT technology, where computer programs attempt to emulate human translators' decisions by learning patterns from large quantities of bilingual texts. Even some of the most recent of these technologies have limitations (see Castilho et al. 2017). However, the popular press has been quick to declare that the “language barrier is about to fall” (Ross 2016). Similar statements are often made by MT developers. It has been recently claimed, for example, that “parity” between humans and an MT system has been achieved (Hassan et al. 2018). However, beyond the use of the term “bilinguals”, information on the linguistic expertise of the crowd workers who are often recruited to assess translations in these evaluations is rarely provided. In addition, the human reference translations used in these comparisons are sometimes permeated by errors,² and information on the level of expertise of the translators is also often limited. While discourses on human parity and the fall of barriers are optimistic about innovation, these discourses also risk promoting the notion that MT systems and human translators are mutually exclusive, which can in turn foster scaremongering about translators' future.

Machine learning, which is the technology behind these discourses, is deemed to be part of a new technological wave often called *the second machine age* (SMA) (Brynjolfsson and McAfee 2014). Views on the SMA's potential for disrupting human labor vary widely, ranging from those who believe it presents positive opportunities for human–computer interaction (Brynjolfsson and McAfee 2014) to those who argue that predictions of economic growth and innovation associated with the SMA are overstated (e.g. Gordon 2014). Irrespective of one's position on the SMA and its disruptive potential, certain trends in employment and the economy observed over the past few decades are quite striking. These trends include a polarization of jobs (Autor 2015; Goos and Manning 2007; OECD 2017) and a reversal in the demand for cognitive labor (Beaudry, Green, and Sand 2013). Surprisingly, these phenomena are often ignored in current debates on trends in professional translation.

The job polarization phenomenon is one of the reverberations of Polanyi's paradox. The fact that repetitive tasks are more easily automatable has meant that middle-education jobs – involving, for example, clerical work – have in the last decades been more at risk of automation than low-education jobs involving manual work, such as serving food or cleaning. This is because low-education jobs often require high levels of adaptability

and human interaction, which are hard to operationalize and automate. Jobs requiring a high level of education are similarly hard to automate, as they usually require tacit knowledge and abstract decision-making. This means that jobs at the opposite ends of the education spectrum are more resistant to automation, which contributed to a U-shaped polarization in employment as a factor of skill level. Automation is not the only factor behind this polarization (see e.g. Salvatori 2015), but there is wide consensus that it is one of its key drivers (Autor 2014, 6; Goos and Manning 2007, 132; OECD 2017, 87).

Translation would be expected to be on the high end of the skill and education spectrum, together with professions where employment is not decreasing because of job polarization. Indeed, as previously pointed out (see Moorkens 2017; Rogers 2017), the US Bureau of Labor Statistics (BLS) projects a positive outlook for translation and interpreting where employment is expected to increase by 18% between 2016 and 2026 (BLS 2017b). This projection outperforms by a large margin the average increase rate expected for all US occupations, which is explained as an effect of “increasing globalization” and “a more diverse US population” (BLS 2017b).

While this positive outlook seems at odds with the debate mentioned in the introduction around translation as a profession under threat, it is worth noting that not all skilled professions have a positive outlook. According to Beaudry, Green, and Sand (2013), the requirement for more cognitive tasks that followed higher investment in technology pre-2000 has reached maturity and led to higher unemployment rates post-2000 in the US among high-skilled workers. Based on a predictive model that considers employment trends before and after the year 2000, it is argued that some high-skilled workers have been forced to occupy lower-skilled positions due to a post-2000 decrease in the demand for cognitive skills (Beaudry, Green, and Sand 2013). While job polarization and this reduction in the demand for cognitive labor may not have directly affected translators, it seems plausible that higher unemployment and poorer conditions in other skilled areas would have made individuals who would not normally pursue a career in translation consider this possibility, thereby increasing competition and potentially affecting working conditions.

Pay across time

Regarding pay, conflicting evidence denotes a potential polarization of the translation market itself. Based on data from market research company Common Sense Advisory (CSA), Doherty (2016, 949) reports that translation rates per word have fallen by up to 50% since 2008, which CSA puts down to budgetary constraints and technology.³ Results from longitudinal analyses of pay in the language services industry are not straightforward, however. Figure 1 shows mean hourly wages for translators and interpreters employed in the US (occupational category 27-3091.00) between 1999 and 2016 (left pane), and for the industry sector “Translation and interpretation activities” (code 7430) in the UK between 2008 and 2016 (right pane). Inflation adjustments reflecting 2016 US dollars and British pounds, respectively, are also provided. In the US, a generally upward trend can be observed, though with a dip after 2012. In the UK, in real terms hourly pay in 2016 was higher than in the two previous years, but lower than the levels observed in 2008–2011.⁴

It should be noted that in the case of the US, the data in Figure 1 conflates interpreters and translators and, in the case of the UK, it pertains to all those employed in the



Figure 1. Mean hourly pay for interpreters and translators employed in the US (occupational category 27-3091.00) between 1999 and 2016 (left pane) and mean hourly pay for industry category 7430 “Translation and interpretation activities” in the UK between 2008 and 2016 (right pane). The red (lower) line shows absolute values, and the blue (upper) line shows inflation-adjusted values.

translation and interpreting industry sector. More importantly, in both cases the data is limited to in-house employment, which generally is the exception rather than the rule for translators – see, for example, the 2016 UK Translator Survey, published by the European Commission, the Chartered Institute of Linguists and the Institute of Translation and Interpreting (EC, CIOL, and ITI 2017, 10). However, compared to most other sources – for example, professional surveys – national wage statistics are of great value as they go back further and at more consistent intervals.

Furthermore, professional surveys do not corroborate a systematic downward trend in pay either. The 2017 Language Industry Survey (Elia et al. 2017) reports a minor drop in rates for independent language professionals in 2016, though with an expectation of an increase of around 5% in 2017. In the 2016 UK Translator Survey, despite several pessimistic comments in the open responses, 42% of 586 respondents reported an expectation that remuneration levels would remain the same for the next three years, 32% expected an increase, 16% expected a decrease and others were not sure (EC, CIOL and ITI 2017, 21). In the fifth edition of the American Translators Association’s (ATA) Translation and Interpreting Survey, 44.8% of 833 translators based in the US reported that their compensation increased from 2013 to 2014, while 30% reported no change and 25.1% reported a decrease (ATA 2016). For translators outside of the US, a slightly more positive scenario is reported, with 49.4% of 403 respondents declaring that their compensation increased, 31.8% that it did not change, and 18.9% that it decreased (ATA 2016).

Concerning results from UK professional associations, a survey conducted in 2011 by the CIOL and ITI show that, of 1,431 responses, 42% reported an increase in rates compared to five years before the survey, 38% reported no change, 10% reported a decrease, and 10% reported this was not applicable (CIOL and ITI 2011, 8).

A survey by Société Française des Traducteurs [French Society of Translators] from 2015 shows that 48.77% of 1140 respondents were satisfied with their turnover in 2015 while 51.23% were not satisfied (SFT 2015). Satisfaction was slightly higher in 2008, when 50.74% of 676 respondents were satisfied against 49.26% who were not satisfied

(SFT 2015). It is worth noting, however, that in both 2015 and 2008 the SFT survey samples were divided virtually in half on this issue, which in terms of pay satisfaction shows again a mixed picture rather than a pronounced downward trend.

The information above suggests that either not all translators are experiencing falling rates, or that for some translators technology's downward effect on unit rates can be compensated by an increase in volume, as some of the results above correspond to overall pay rather than rates per word. Since samples in professional association surveys consist largely of these associations' own members (see e.g. ATA 2016), it may be that falling rates are affecting mostly the less professionalized sectors of the market, which are likely to be underrepresented in these association's membership bases. If this is the case, mechanisms that have a de-professionalizing effect on certain market sectors may in the short term be a more concerning issue than technology.

The impact of technology on translation jobs

The work automation literature makes interesting predictions on the likelihood of translators and interpreters being replaced by technology. These studies merit attention not only with respect to their results, but also – and perhaps most importantly – with respect to the variables they exploit to make these predictions. One of the most comprehensive studies of this kind used occupational information available on O*NET, a database of US occupation descriptions (O*NET 2017), to model the probability of US occupations being automated in the next decade or two (Frey and Osborne 2017). This was done based on the extent to which occupations listed on O*NET involved aspects deemed to be a challenge to machine learning. Three bottlenecks to machine learning's advancement were identified: the requirement of perception and manipulation, creative intelligence, and social intelligence (Frey and Osborne 2017, 264). Occupations described on O*NET as requiring a high level of knowledge, skill and other variables corresponding to these bottlenecks were estimated to have a low probability of becoming automated. Translation and interpreting's automation probability was estimated to be 38%, which placed translators and interpreters into the group of “medium-risk” occupations. While these predictions are no more than rough estimates – especially when considered in isolation for a single occupation – on first impression the result for translators and interpreters seems alarming.

Of the specific O*NET variables used by Frey and Osborne (2017), “originality” and “social perceptiveness” – which were among the variables representing creative and social intelligence, respectively (Frey and Osborne 2017, 264) – seem particularly relevant for translation. O*NET holds detailed information from surveys where professionals rate the level to which different types of knowledge and skill are required in their occupation. At the time of writing, of 52 abilities, “originality” is listed in twentieth place for translation and interpreting, and “social perceptiveness” is listed in seventh place out of 35 skills. Both originality and social perceptiveness rank lower compared to skills and abilities that are traditionally regarded as part of the “core” of what translation involves, such as “reading comprehension” and “writing” (O*NET 2016). On the one hand, it is plausible to regard translation as an activity that requires a higher level of writing skill than of social perception. On the other hand, the arguably high automation probability for translators and interpreters reported by Frey and Osborne reflects the relatively lower level of

importance attributed to creative and social intelligence in the O*NET data for these occupations, which could be a sign that placing more emphasis on the social aspects of translation may enhance the profession's sustainability.

In a study that estimates the amount of creativity involved in occupations whilst mapping these results to the occupations' automation probability, the translation and interpreting industry sector in the UK is deemed to have an 88.3% probability of involving creativity and a 5.8% probability of being automated (Bakhshi, Frey, and Osborne 2015). These results seem quite different from those reported by Frey and Osborne (2017) for the US. However, further to the general uncertainty around these predictions, Bakhshi, Frey and Osborne report individual probabilities per industry and not per occupation, which could be one of the reasons behind such a different result. In addition, in the UK translators are merged with authors and writers into a single occupational category (Standard Occupational Classification 3412), which is likely to have inflated the amount of creativity and decreased the probability of automation that would have corresponded to translators alone. Irrespective of the drivers behind this difference between the two studies, it is worth noting that creativity is regarded as a bottleneck to automation in both.

In translation, the fact that more creative domains are more automation-resistant means that the diversity of texts and markets in the translation industry is likely to modulate translation's automation probability and put more technical areas under higher risk. Unequal risk across different sectors may in turn make qualified translators leave technical domains towards more creative areas of specialization involving marketing and promotional texts. Indeed, moving to creative sectors is often implied as a solution to automation threats (Johnson 2017). Responses to previous surveys suggest this process may already be in motion: "As technical translation becomes increasingly automated, technical translators move into marketing translation and push down prices" (EC, CIOL and ITI 2017, 23). It can be argued, however, that such a hierarchical approach to the translation market entails consequences that could ultimately be detrimental to the profession. Even in textual contexts found in technical domains, machines complement rather than replace translators (see Lumeras and Way 2017). A departure to creative sectors could reduce the pool of qualified professionals in technical translation and ultimately fragment translators' role by narrowing the range of tasks they can oversee and undertake.

A practical sign of a potential fragmentation of translators' role linked to the notion of creativity is the branding of separate services like "transcreation". This term stands for a mixture of "translation" and "creation". It is often used to refer to translation tasks from marketing and advertising domains that require higher levels of creativity and "re-creation" of the original text. The use of the term in the industry is now commonplace (see e.g. Lionbridge 2017). From a theoretical perspective, however, the need for a different term to describe "creative translation" is often questioned since target-text-oriented approaches to translation may already accommodate transcreation tasks (see Pedersen 2014).

The need for the term may stem from the different processes it requires within a company (Risku, Pichler, and Wieser 2017). In addition, as with other activities branded as separate services in the translation industry – e.g. localization (see Pym 2004) or MT post-editing, where translators edit MT output – these tasks are not mutually exclusive career choices. A single translator can offer a range of services depending on the needs of individual clients, so the existence of separate services is not in itself problematic. However, segmenting

the market into multiple services *and* promoting a notion that some of these services are superior in terms of prestige and professional standing could have harmful effects. As an intercultural communication service, any form of translation may involve, for instance, deciding on, adapting or producing the technology (see Kenny and Doherty 2014) that is suitable to the context or coaching clients on the kinds of translation approach that seem appropriate for the target text's purpose. While automation may in the future play a larger role in the process of managing translation projects (Massardo and van der Meer 2017), tasks of the kind described above involving guidance on purposefulness and the real-world use of texts are likely to remain unaffected by machines for many years (see Autor 2015, 26). They are also unlikely to be effectively undertaken by bilinguals with no training or experience in translation. Furthermore, they are not unknown to discussions in translation theory (Nord 2014) and on translators' professional role (Kinnunen and Koskinen 2010). As part of the effects of market segmentation, Pym (2004, 164) mentions "a narrowing of the role of translation, and thus an overlooking of the knowledge and advice that translators might be able to contribute". I argue that any approach to automation threats that involves abandoning technical domains is likely to reinforce these market segmentation effects. Branding services separately may be inevitable, but hierarchizing them could ultimately be a missed opportunity for keeping all these services closely knit under the aegis of translators.

A recent report by the Translation Automation User Society (TAUS) places great emphasis on creative tasks as the key to translators' sustainability. In describing translators' place in the future of the translation industry, the report states that translators will turn into writers, consultants on cultural issues, and critical to brand and product success (Massardo and van der Meer 2017, 27). While these predictions are sensible, it is worth noting that in the context of functional and target-oriented approaches to translation – see, for example, Nida's ([1964] 2000) dynamic equivalence – the role of the translator may already accommodate most if not all these aspects. If translators do not currently operate in these capacities, the issue is likely to lie with current working models, rather than with the profession itself.

Translators' attitude to pay and automation

Establishing the motivations behind translators' stance on MT vis-à-vis business practices and market trends is an important step towards addressing the issues discussed in the previous sections. Translators' stance on MT is often found to be negative (see e.g. Läubli and Orrego-Carmona 2017; Meijer 1993), but the potential connections between this positioning and wider economic issues is not always clear. This lack of clarity applies particularly to whether it is technology itself or its market effects that are predominantly deemed problematic. The difference between having a negative attitude to technology and having a negative attitude to the perceived repercussions of technology is a small but important one. In the first case, translation technologies would need to be replaced, improved or eradicated for any problems to be solved, whereas in the second case finding solutions may be a matter of changing practices rather than technologies. These possibilities are not mutually exclusive; improving translators' experience is likely to require changes to technology and to practices. However, to my knowledge research on the link between MT and wider economic issues in translators' discourse is to date limited.

Guerberof (2013) surveyed opinions on MT post-editing from 24 translators and three reviewers. She mentions that translators in the survey had had mixed experiences with MT, but that they were not necessarily reluctant to use it or unsatisfied with pay. Guerberof's sample consisted of translators who were "in general quite familiar with machine translation and post-editing" (ibid., 92). While this provides useful insights, it makes the study more susceptible to represent just the views of tech-savvy translators. This issue applies particularly to potential fears of job displacement and automation anxiety, which may be more common among those with no knowledge of MT who might "fear the unknown".

More recently, Läubli and Orrego-Carmona (2017) investigated translator groups on Facebook and LinkedIn and carried out a sentiment analysis of tweets mentioning MT. Their focus was mainly on whether opinions towards MT were positive, negative or neutral, however. Rates of pay and the economic dimensions of MT use were not directly addressed.

Cadwell, O'Brien, and Teixeira (2018) used focus groups to research the factors behind the adoption and non-adoption of MT at the European Commission and among in-house translators at a UK translation company. Pay is not a prominent topic in their results, but they report that "compensation might be expected to be more significant in other institutional or commercial settings" given that their sample consisted entirely of salaried workers – i.e. who might not be able to appreciate MT's effects on the wider market (ibid., 312). This study too leaves a gap with regard to the distinction between attitudes to MT and to its economic reverberations.

Compiling a corpus of professionals' discourse

To investigate the issues mentioned above, I crawled content from forum postings and translator blogs to compile a corpus. Previous research has used blogs and forums in a similar way to analyze translators' discourse (e.g. Flanagan 2016; McDonough Dolmaya 2011a, 2011b). The use of blog and forum content in this context inevitably restricts results to the population of translators who publish their views online, usually in a language that is convenient to the researcher – i.e. random sampling is not possible (see McDonough Dolmaya 2011a). However, unlike surveys, this method has the advantage of allowing for an analysis of unsolicited comments that are free of modulation from the question, so this methodology is of great value.

The WebBootCat tool (Baroni et al. 2006), available within the Sketch Engine corpus analysis platform (Kilgarriff et al. 2014) was used to crawl the data.⁵ Two major translation forums, ProZ.com and TranslatorsCafé.com, and blogs on ATA's Blog Trekker list (ATA 2017) were established as the sampling frame. WebBootCat could not crawl content from ProZ, however, so this forum was excluded. Blogs that were not in English or which only concerned interpreting or language and linguistics more generally, rather than translation, were not considered. Date restrictions were not specified and, as webpages containing forum postings can be quite text-sparse, no minimum content size per page was established.

There was considerable variation between blogs on the ATA list in terms of size and crawling success.⁶ To avoid over-representing the views of translators who had larger blogs, I set out to retain just the first 35,000 words crawled from each blog. This limit

helped to balance the blog composition in the corpus by ensuring similar amounts of blog content across various sources. Smaller blogs that were below this limit and blogs that exceeded it only slightly because of larger individual documents at the threshold were retained if their size was within 0.5 standard deviation from the mean amount of crawled content for all blogs. After crawling the blogs, the remainder of the corpus was crawled from TranslatorsCafé. At the time of writing this forum has over 200,000 registered members (TranslatorsCafé 2017) and so would be expected to represent a plurality of views. With the use of Sketch Engine's built-in tools, the corpus was de-duplicated (a process that removes repeated content, which was done at a sentence level), lemmatized,⁷ and part-of-speech-tagged. After compilation, a corpus of approximately two million tokens (971,085 tokens from 28 blogs, and 1,036,854 tokens from TranslatorsCafé) was available for analysis.

Keyword frequencies

To obtain a first impression of topics to be investigated further, the incidence of a series of keywords was examined. Human-generated keyword lists are inevitably subjective and unexhaustive. One way of reducing subjectivity in this context is to contrast the crawled corpus with a larger reference corpus to automatically generate a list of terms that are disproportionately frequent in the crawled content. However, this produces a general keyword list and would not fit the purpose of investigating specifically the technological and economic aspects of translation. A manually generated list was therefore deemed more suitable.

The keywords were searched as the lemmas, so plurals were also retrieved. For ambiguous terms that could be parts of speech other than noun, the search was set to return nouns only. This avoided counting terms that would have a weaker connection to the issues discussed here (e.g. “to rate” or “to demand” as possible results for the keywords “rate” and “demand”). Restricting the search to nouns also ensured that the results were more comparable. Among technology-related terms, verb forms (e.g. “machine translate” or “automate”) were found to be less frequent. To avoid skew from the fact that certain keywords might occur multiple times in a single document simply because the entire page is about the same topic, the corpus hits were filtered so that only the first document occurrence remained. From a practical perspective, this step also reduced the number of hits to be manually examined in a subsequent qualitative analysis, which was necessary given the laborious nature of this approach.

Figure 2 shows the full list of searched keywords and their prominence in the corpus as per the procedure described above. To my knowledge, it is the first time that the frequency of topics like “machine translation”, “competition” and “crowdsourcing” is measured and contrasted in the translation discourse. The results reveal interesting trends. In particular, crowdsourcing is a much less prominent topic compared to MT, translation memory and CAT. Topics like technology, rates, price and machine translation can all be found at the top of the frequency list, which suggests that technological and economic issues are similarly prominent in translators' discourse.

It should be noted that these counts are exploratory. Some of the keywords (e.g. “rate”) have a wider range of meanings than others and although the postings are from translator webpages, clients, project managers and other professionals also contribute to the crawled

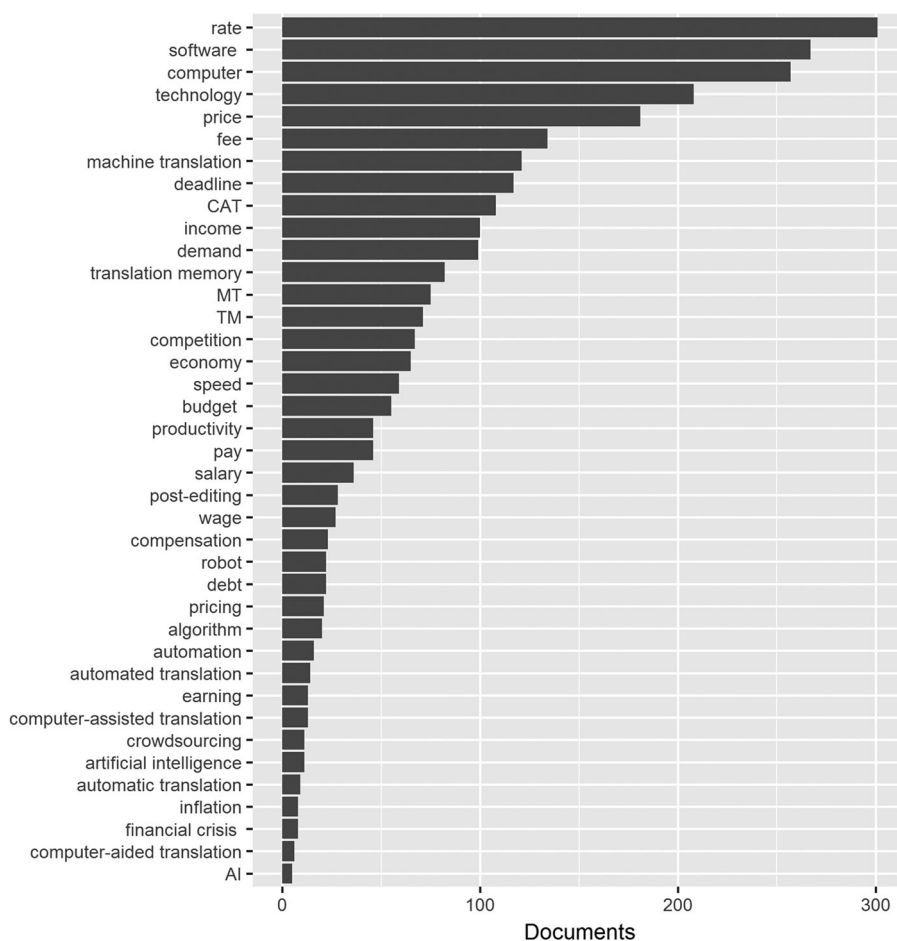


Figure 2. Number of documents in the corpus (x-axis) containing the keywords as nouns (y-axis). The results include inflected forms and alternative spellings (e.g. “post editing”, “crowd-sourcing” or “computer assisted translation”). When acronyms were directly adjacent to the corresponding full term to indicate an abbreviation, this was counted only once under the full term. Similarly, results for “computer” exclude cases where the word was part of the terms “computer aided translation” or “computer assisted translation”.

websites (see McDonough Dolmaya 2011b). Nevertheless, these results point to interesting hypotheses on the frequency of different topics in translation professionals’ discourse. They also serve as a framework for the qualitative analysis presented below, where these issues are addressed.

Qualitative analysis

To examine key topics shown in Figure 2, hits for the keywords “rate” and “machine translation” were selected for further analysis. These two terms were chosen firstly because they had high frequencies and secondly because they allowed ambiguous cases to be solved based on the data alone. “Technology” and “software”, for example, were not considered

as they were deemed difficult to disambiguate based just on the text. For instance, “software” may refer to translation memory tools or MT systems, and without asking translators directly it can be difficult to establish what they meant. “Rate” is more ambiguous than “machine translation” and can be used to refer to other topics (e.g. “growth rate” or “exchange rates”). However, unlike the case of “technology” or “software”, in the case of “rate” ambiguity can be solved by examining the content and filtering out unwanted cases. While there were other keywords on the topic of pay that could have been used, such as “price” and “fee”, these were less frequent than “rate” and could also refer to issues other than translation pay (e.g. “membership fees” or “[the] price for [software] licenses”).

Several manual filtering procedures were implemented prior to the qualitative analysis. Hits for “rate” that did not directly concern rates of pay in translation were excluded. Results that were specific to interpreting, transcription, dubbing, subtitling, and desktop publishing – for instance regarding rate structures for these services – were also filtered out. This step ensured greater comparability between hits for “rate” and “machine translation”, as considerable variation would be expected in MT uptake and pay across these services. Similarly, only content written by practising translators was considered. Comments for whom background information was private (i.e. not accessible) or unavailable were excluded. While this filtering process further reduced the number of postings to be qualitatively investigated, it also made for a more detailed and controlled analysis. Merging multiple keywords from the same semantic field is an approach that could be implemented in future research. However, this controlled procedure would be difficult to implement based on a larger sample including multiple keywords.

After the filtering steps described above, a total of 110 keyword hits were retained. The hits occurred in blog and forum postings themselves⁸ as well as in replies posted in the blogs’ comments section. The analyzed content was published by a total of 50 translators based in 22 countries (38% of them in the United States) and who had between 2 and 37 years of professional experience (for 78% of them, at least 10 years). The material was published between 2005 and 2017 (90% of it from 2010 onwards).

The content was analyzed with a view to identifying the key point of the message. Descriptions such as “positive”, “negative” and “neutral” were avoided given previous studies’ focus on this approach. Rather, I grouped the postings into fine-grained categories that summarized the translators’ remarks in as close a way as possible. To measure any subjective fuzziness in the annotation procedure, I gave the full list of categories and a random selection of 50 postings to an independent translation researcher for a separate classification.⁹ To keep the separate classification as independent as possible, I did not give the independent researcher detailed classification instructions. However, I told her that not all categories had to be used (i.e. because she was annotating just a sample of the material) and that, as per my own procedure, when a posting could be classed with more than one category, the category emphasized nearer the keyword hit should be selected. Cohen’s kappa (a score that measures the agreement between two annotators where 0 = no agreement and 1 = perfect agreement) was 0.628 for postings containing the “rate” keyword and 0.635 for “machine translation”. These results can be categorized as “substantial” agreement in both cases (Landis and Koch 1977, 165). The cases of disagreement were then discussed between the two researchers as a way of further tuning the coding and reducing subjectivity.

Results of the analysis are presented in Table 1 for the “rate” keyword and in Table 2 for “machine translation”. In the case of rates, descriptive knowledge-sharing comments (e.g. on how to calculate quotes) were the most frequent ones. A similarly descriptive category on sharing knowledge of MT (*Descriptive/Technical*) was the second most frequent one among comments containing the “machine translation” keyword. This suggests that a large part of translators’ online discourse on these issues is geared towards offering and obtaining help.

The remaining comments reveal interesting aspects of translators’ stance on specific issues. Regarding rates, *Downward pressure from agencies/an agency/the client* was the most frequent non-descriptive category. Comments in this category reflected a strong sense that agencies often fail to value translators’ expertise and act as a major factor affecting rates of pay. In a reply to a blog posting, T2¹⁰ writes: “[agencies] have shaped the translation sector to suit their own business models. [...] They have been driving down rates to a para-professional level and below” (16 May 2013). Similar comments by other translators show clear signs of discontent with agencies, which often concerned requests for lower rates – for example to compensate for larger volumes. There were also positive comments towards clients, albeit in lower number. Most of these fell into the categories *High or fair rates are still possible/Rates not going down*, *Did not charge low rates and had work*, and *Client agreed to pay asked rate*.

As expected, technology came up as an issue in the analysis concerning rates. This was reflected in postings under the categories *Negative impact of CAT, MT and/or TM* [translation memory] *discount structure* and *Misleading promises of productivity gains and cost savings made by CAT tool developers*. However, clients themselves and the business practices of translation agencies were more prominent than technology in translators’ comments on pay. Even comments in the technology-related categories often concerned not

Table 1. Classification of postings containing the “rate” keyword.

| Rates | Count |
|--|-------|
| Descriptive/Knowledge sharing | 19 |
| Downward pressure from agencies/an agency/the client | 14 |
| Negative impact of CAT, MT and/or TM discount structure | 6 |
| High or fair rates are still possible/Rates are not going down | 5 |
| Suspicion of scam | 4 |
| Competition | 3 |
| Rates low for specific location or language pair | 3 |
| Difficult to increase rates with existing clients | 2 |
| Finding clients who pay your rates requires marketing | 2 |
| Minimum rate for small jobs/premium weekend rate pays off | 2 |
| Translators should be valued like other skilled professionals | 2 |
| When offered low rate, translators should find other clients rather than complain | 2 |
| Client agreed to pay asked rate | 1 |
| Communication issues in job offer from agency | 1 |
| Did not charge low rates and had work | 1 |
| Hourly rates preferable for certain tasks | 1 |
| Income not necessarily higher when working for direct clients | 1 |
| Late payment | 1 |
| Makes more money writing than translating | 1 |
| Misleading promises of productivity gains and cost savings made by CAT tool developers | 1 |
| Not interested in setting high rates | 1 |
| Pressure from freelance platforms | 1 |
| Translators should be more entrepreneurial and avoid agencies | 1 |
| Total | 75 |

Table 2. Classification of postings containing the “machine translation” keyword.

| MT | Count |
|---|-------|
| Errors/Low quality | 8 |
| Descriptive/Technical | 5 |
| Has limitations/Not a threat to qualified professionals | 5 |
| A way of clients saving money | 3 |
| Can be helpful if properly applied | 2 |
| Not always effective/Not suitable to all tasks | 2 |
| Can be helpful | 1 |
| Can be helpful, but is problematic for quoting | 1 |
| Can be misapplied | 1 |
| Despite the hype, MT and post-editing are small sources of income for companies | 1 |
| Devalues professional translators | 1 |
| Is gaining ground | 1 |
| Might be helpful one day to cope with volumes, but humans still required | 1 |
| MT should not replace human aspects in translator training | 1 |
| Represents new opportunities | 1 |
| Translation is essentially human; cannot be done by machines | 1 |
| <i>Total</i> | 35 |

technology itself, but rather how it is used, a possibility mentioned earlier in the article. T13 writes:

Obviously, it would not be in anyone’s interest to turn our backs on a tool that has the potential to drastically increase output and efficiency, but at the same time, it is simply unreasonable to bill MT leverage according to established repetition rates based on human-confirmed TUs [translation units] (11 December 2012).

Here the stressed issue is not the use of MT itself, but rather how projects involving MT are billed. Most other comments that linked falling rates to MT similarly concerned business practices. For example, T34 implied that technology might be oversold and negatively affect pay. She talks of “false advertising of the alleged capabilities of Machine Translation” (19 December 2016).

The other postings regarding rates of pay concerned mostly very specific issues – for example, problems with late payments, potential scams, and translators’ stance on unpaid translation tests or declined quotes (see Table 1). There were also postings that highlighted the problem of competition and how online freelance platforms (e.g. UpWork.com) can put pressure on pay, but these issues were not as prominent as technology and pressure from clients/agencies.

The analysis of postings containing the “machine translation” keyword is presented in Table 2. Here it was noted that translators’ comments concerned mostly the limitations of the technology and, as observed in the analysis of the “rate” keyword, how it is used.

Regarding the technology’s limitations, postings that fell into the categories *Errors/Low quality* or *Has limitations/Not a threat to qualified professionals* suggested that in most cases translators do not think their professionalism competes with MT, though at times with the concession that MT might affect “lower ends” of the market. T14 writes:

I don’t lose sleep over machine translation. When computers are writing great books, I’ll worry. In terms of the effect on my business right now, I don’t worry. [...] But I do think that at some point, we’ll feel MT eating into the lower end of the translation market (5 December 2016).

In a similar vein, when asked for his view on Google Translate, T1 writes: “I doubt very much that machine translation will ever be perfect” (07 January 2017).

Translators’ comments on MT errors can also reflect self-affirmation against, and over-expectation of, the technology (see Läubli and Orrego-Carmona 2017). While strong opinions along these lines were to some extent observed under *Errors/Low quality* – for instance with a description of MT as “totally ridiculous” – there were also more measured comments that denoted a good level of understanding of MT. For example, regarding the difference between “journal” and “magazine”, which in the sense of a periodical are not distinguished in Spanish, T36 writes “Google Translate might pick the right word if your sentence contains the name of a well-known magazine like ¡Hola! (the Spanish version of Hello!), but for a 1940s publication it will most likely just be guessing” (28 May 2012).

Regarding business practices, the effects of the low-cost appeal of MT were often mentioned. In a posting under *A way of clients saving money*, T49 writes “My guess is that these former clients switched to free or cheaper sources, machine translation or translation agencies in third world countries” (23 April 2013). In a posting from 2008, under category *Is gaining ground*, T19 referred to MT as a form of “softsourcing”, i.e. when work is outsourced to software: “The word is new but it’s a word to watch because it’s got some future, especially in our profession: Machine Translation is a typical case of softsourcing and it’s slowly but surely gaining ground” (1 March 2008). These comments came close to regarding MT as a threat to human translators or a technology that may prevent them from securing certain jobs. It is noteworthy, however, that these comments stress the effects of MT on the market rather than, for example, an intrinsic negativity to the technology or its effects on the translating process.

There were also comments that seemed more welcoming of MT, which mostly fell into the categories *Can be helpful* and *Represents new opportunities*. Translators also contended that MT is only helpful if properly applied, which was classed mostly with categories *Can be misapplied*, *Can be helpful, but is problematic for quoting*, *Can be helpful if properly applied*, and *Not always effective/Not suitable to all tasks*.

Generally, this analysis shows that translators’ approach to MT and the profession is more nuanced than perhaps suggested by popular conceptions. For most translators in the present sample, job displacement was not an immediate concern. Their criticisms often referred to certain business practices related to MT use (e.g. concerning billing techniques) and to the technology’s current limitations. T47 encapsulates the latter point quite well. She says: “me (and most of my colleagues, I guess) are not being hostile towards technology as such, but rather towards the low quality that it provides at this point” (25 June 2015).

Regarding the discussion on automation threats to translation provided earlier in the article, these results suggest that market segmentation trends and the potential devaluing of technical areas of specialization (traditionally considered non-creative) may be rooted not in what translators think of MT or their negative attitudes to it, but in how MT risks being exploited. MT itself is only likely to represent a threat if translation is regarded as the mere transcoding of linguistic symbols. Seeing translation in this way is not compatible with settings where language is a commercial product. Indeed, the many translation industry roles with an explicit focus on client relationship and products’ context of use (e.g. “solutions manager” or “business development director”) act as evidence of the comprehensive service offered by translation companies. However, problems are likely

to arise if technological advancement fosters the perception that roles of this kind can be fulfilled by professionals with little knowledge of translation practice while MT is applied to tasks that are more obviously linguistic. Based on the discussion provided above, I argue that aspects of this kind relating to business practices and the organization of translators' work represent a more fruitful direct target of concern in the debate on translation's future than MT or advances in technology alone.

Some of the issues discussed here, such as market segmentation and a fragmentation of translators' role, indicate a gap between the translation industry and translation studies in their understanding of what translation involves and of what translators are skilled to do. On the one hand, the industry might be fit to diagnose and address these issues as and when they appear (e.g. where client satisfaction is affected). On the other hand, the onus is also arguably on those with linguistic expertise and professional translation qualifications to raise awareness of what the role of the translator should encompass.

Conclusion

This article aimed to situate translators' discourse on machine translation and its potential economic reverberations within the context of broader work automation phenomena and empirical information on the translation profession. Two key findings are reported. First, MT was a secondary issue in translators' comments on pay; most grievances were based on business practices themselves. Translators' views on the profession were more nuanced than perhaps suggested by the popular discourse, but market practices and the ways in which work is organized were often found to be problematic. Second, translators' negative attitude to machine translation may at times be misunderstood. Based on data corresponding predominantly to the period 2010–2017, most criticism of MT concerned primarily not a fear of being outperformed by MT systems or an intrinsic aversion to the technology, but rather MT's current limitations and some of the business practices that surround its use. While these findings are based on a relatively small sample, I argue that, in the discussion on translators' outlook, technology cannot be decoupled from its market reverberations and economic effects.

The article discussed trends that have affected the labor force of various countries for the past ten to twenty years, including increased automation of middle-skilled clerical work (e.g. Autor 2014) and a reduction in the demand for cognitive labor (Beaudry, Green, and Sand 2013). Some of these phenomena might have only indirectly affected translation, a skilled profession with predictions of increasing demand (BLS 2017b). However, the 2008 financial crisis and developments in MT technology are not the only factors influencing translators' working conditions. Keeping in sight long-term trends in employment and work automation can help to improve the general understanding of translators' current position and foster more fruitful conversations on the profession's future.

On the topic of rates, pressure from clients and agencies was a prominent issue in translators' discourse. Here it may be that alternative forms of management and ownership merit future debate and experimentation. Business initiatives where translators themselves provide advice to end-clients and make decisions on technology and translation approaches based on the commission's requirements seem particularly worth considering. While initiatives that broaden translators' role have been discussed in the past (e.g. Kenny

and Doherty 2014; Kinnunen and Koskinen 2010; Pym 2004), some of the responses to advances in MT in the popular discourse may entail unexpected negative consequences. One of these consequences is the assumption that the role of the translator as a comprehensive communication professional is only possible in more creative areas of the market where the use of MT is limited. Predictive studies on work automation agree that creativity is a key modulator of automation potential. Indeed, because of the automation resistance of creative tasks, translators are often instructed to move away from technical areas of specialization to more creative domains. However, I argue that the automation resistance of creative tasks should not be used to stimulate an exodus of qualified translators to creative markets, as this may induce de-professionalization in technical areas and entail an overall narrowing of the concept of translation as a practice and profession.

Generally, dystopian discourses on translation should be approached with caution. Open dialogue among translation industry stakeholders and the exploration of business models that integrate rather than fragment the role of translators across domains are considered here to be more productive responses to advances in technology than giving in to automation anxiety.

Notes

1. For a brief history of the impact of technology on employment, see Frey and Osborne (2017) and Mokyr, Vickers, and Ziebarth (2015).
2. A random sample of just ten of the 2001 lines from the target Chinese-English human translation dataset used by Hassan et al. (2018) (available at <https://github.com/MicrosoftTranslator/Translator-HumanParityData>), for example, includes sentences such as “A salon will be hosted by Southern California Branch of Society of Architectural Historians and the co-authors of Los Angles [sic] Central Museum: Art and Architectural History, Arnold Schwarzman and Stephen Gee” and

Pang Zhihao, researcher at China Academy of Space Technology said that the reason why human beings are so keen to explore Mars is because it has major scientific, technological and various other significance [sic], and is even related to the future of humanity.

Typos and awkward passages such as “Los Angles” and “various other significance” suggest that, although the data was vendor-created, the human translations were not carried out to a high standard so its use as a benchmark in MT evaluations should be approached with caution. The co-authored book mentioned in the first sentence also seems to be about The Los Angeles Central Library and not about a museum (see <https://www.angelcitypress.com/products/lac>).

3. Closed CSA reports are not available to academic institutions and access to the material was not authorized, so I am unable to provide specific details of pricing research carried out by CSA in this article.
4. The US data was obtained from the Bureau of Labor Statistics (BLS 2017a). The UK data was obtained from the Office for National Statistics (ONS 2017). The coefficient of variation (CV), a measure that reflects sample size and indicates the quality of the estimates, ranges between 1.1% (in 2002) and 2.3% (in 2010 and 2013) for the US data, and between 6.1% (in 2015) and 20% (in 2012) for the UK data. The true pay values are expected to be within \pm twice these percentages, which means that the UK estimate for 2012, in particular, should be approached with caution. The inflation adjustment was calculated based on consumer price indexes (all items) for the two countries published by the Organization for Economic Co-Operation and Development (OECD.Stat 2017). Older data for the UK is not

provided because a different industry sector (“secretarial and translation activities”) was used for translation before 2008.

5. The content was crawled between 11 and 13 August 2017.
6. Some blogs had large amounts of content, some were small, and some did not allow Web-BootCat to crawl their content and were therefore excluded.
7. That is, a process whereby all inflected forms of a word (e.g. plurals) are grouped together under the same base words or lemmas (see Biber, Conrad, and Reppen 1998, 29).
8. When the hits occurred in quoted passages, the following hit on the page was considered when the posting author’s stance on the issue was clear. When this was not clear or when the entire posting was a quote, the quote’s source was considered instead if the identity of the author as a translator could be established. If this information was not available, the hit was excluded.
9. The material was coded in a spreadsheet containing passages from the postings including the keyword hit together with links to where the postings appeared online where more context was available.
10. Even though the content analyzed is publicly available, as in previous research (Olohan 2011), I regarded the translators as research participants, so their identities are not revealed here. Consent was sought from all translators mentioned directly in the text. The comments were retained where a response was not obtained.

Disclosure statement

No potential conflict of interest was reported by the author.

Note on contributor

Lucas Nunes Vieira is a Lecturer in Translation Studies with Technology at the University of Bristol (United Kingdom). He researches the use of machine translation in human translation workflows, with a focus on the cognitive aspects that surround the use of technology in translation tasks and how this affects processes, products and attitudes. Lucas has a BA in language and linguistics from Universidade Federal Fluminense (Brazil), an MA in language technology from Universidade do Algarve (Portugal) and Université de Franche-Comté (France), and a PhD on machine translation post-editing from Newcastle University (United Kingdom).

ORCID

Lucas Nunes Vieira  <http://orcid.org/0000-0003-3038-4001>

References

- Alonso, Elisa, and Lucas N. Vieira. 2017. “The Translator’s Amanuensis 2020.” *The Journal of Specialised Translation* 28: 345–361.
- ATA (American Translators Association). 2016. *ATA Translation and Interpreting Services Survey*. American Translators Association. Accessed December 4, 2017. http://www.atanet.org/publications/ata_publications.php.
- ATA (American Translators Association). 2017. *American Translators Association (ATA) Blog Trekker*. American Translators Association. Accessed August 11, 2017. http://www.atanet.org/resources/blog_trekker.php.
- Autor, David. 2014. “Polanyi’s Paradox and the Shape of Employment Growth.” *National Bureau of Economic Research Working Paper Series* No. 20485. doi:10.3386/w20485.
- Autor, David H. 2015. “Why Are There Still so Many Jobs? The History and Future of Workplace Automation.” *Journal of Economic Perspectives* 29 (3): 3–30.

- Bakhshi, Hasan, Carl Benedikt Frey, and Michael A Osborne. 2015. "Creativity vs. Robots. The Creative Economy and the Future of Employment." *Nesta*. Accessed December 4, 2017. https://www.nesta.org.uk/sites/default/files/creativity_vs._robots_wv.pdf.
- Baroni, Marco, Adam Kilgarrieff, Jan Pomikalek, and Pavel Rychlý. 2006. "WebBootCaT: A Web Tool for Instant Corpora." In *Proceedings of the EuraLex Conference*, edited by Elisa Corino, Carla Marello, and Cristina Onesti, 123–132. Edizioni dell'Orso.
- Baumgarten, Stefan, and Jordi Cornella-Detrell, eds. 2017. "Translation in Times of Technocapitalism." *Target* 29 (2): 193–200.
- Beaudry, Paul, David A. Green, and Benjamin M. Sand. 2013. "The Great Reversal in the Demand for Skill and Cognitive Tasks." *National Bureau of Economic Research Working Paper Series* No. 18901. doi:10.3386/w18901.
- Biber, Douglas, Susan Conrad, and Randi Reppen. 1998. *Corpus Linguistics: Investigating Language Structure and Use*. Cambridge: Cambridge University Press.
- BLS. 2017a. *Occupational Employment Statistics*. Bureau of Labor Statistics. Accessed December 4, 2017. <https://www.bls.gov/oes/tables.htm>.
- BLS. 2017b. *Occupational Outlook Handbook*. Bureau of Labor Statistics. Accessed December 4, 2017. <https://www.bls.gov/ooh/media-and-communication/interpreters-and-translators.htm#tab-6>.
- Brynjolfsson, Erik, and Andrew McAfee. 2014. *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. New York and London: W. W. Norton & Company.
- Cadwell, Patrick, Sharon O'Brien, and Carlos S. C. Teixeira. 2018. "Resistance and Accommodation: Factors for the (Non-) Adoption of Machine Translation among Professional Translators." *Perspectives* 26 (3): 301–321.
- Castilho, Sheila, Joss Moorkens, Federico Gaspari, Iacer Calixto, John Tinsley, and Andy Way. 2017. "Is Neural Machine Translation the New State of the Art?" *The Prague Bulletin of Mathematical Linguistics* 108: 109–120.
- CIOL and ITI. 2011. *2011 Rates and Salaries Survey for Translators and Interpreters*. Chartered Institute of Linguists and Institute of Translation and Interpreting. Accessed January 15, 2018. <https://www.iti.org.uk/attachments/article/1066/201120Rates20and20Salaries20Survey.pdf>.
- Cronin, Michael. 2013. *Translation in the Digital Age*. London and New York: Routledge.
- Doherty, Stephen. 2016. "The Impact of Translation Technologies on the Process and Product of Translation." *International Journal of Communication* 10: 947–969.
- EC, CIOL, and ITI. 2017. *2016 UK Translator Survey: Final Report*. European Commission. Accessed December 4, 2017. https://ec.europa.eu/unitedkingdom/education/languages/2016-survey-of-translators-based-in-UK_en.
- Elia, EMT, EUATC, FIT Europe., GALA, and LIND. 2017. *2017 Language Industry Survey – Expectations and Concerns of the European Language Industry*. European Commission. Accessed October 19, 2018. https://www.euatc.org/industry-surveys/item/download/7_4300f98507d0143a98867fb4e6dfa1f2.
- Flanagan, Marian. 2016. "Cause for Concern? Attitudes towards Translation Crowdsourcing in Professional Translators' Blogs." *The Journal of Specialised Translation* 25: 149–173.
- Frey, Carl Benedikt, and Michael A Osborne. 2017. "The Future of Employment: How Susceptible are Jobs to Computerisation?" *Technological Forecasting and Social Change* 114: 254–280.
- Goos, Maarten, and Alan Manning. 2007. "Lousy and Lovely Jobs: The Rising Polarization of Work in Britain." *The Review of Economics and Statistics* 89 (1): 118–133.
- Gordon, Robert J. 2014. "The Demise of U.S. Economic Growth: Restatement, Rebuttal, and Reflections." *National Bureau of Economic Research Working Paper Series* No. 19895. doi:10.3386/w19895.
- Guerberof, Ana. 2013. "What do Professional Translators Think about Post-Editing?" *The Journal of Specialised Translation* 19: 75–95.
- Hassan, Hany, Anthony Aue, Chang Chen, Vishal Chowdhary, Jonathan Clark, Christian Federmann, Xuedong Huang, et al. 2018. *Achieving Human Parity on Automatic Chinese to English News Translation*. Accessed 23 March 2018. <https://arxiv.org/abs/1803.05567>.

- Johnson. 2017. "Why Translators Have the Blues. A Profession under Pressure." *The Economist*, May 24. <https://www.economist.com/news/books-and-arts/21722609-profession-under-pressure-why-translators-have-blues>.
- Kenny, Dorothy, and Stephen Doherty. 2014. "Statistical Machine Translation in the Translation Curriculum: Overcoming Obstacles and Empowering Translators." *The Interpreter and Translator Trainer* 8 (2): 276–294.
- Kilgariff, Adam, Vít Baisa, Jan Bušta, Miloš Jakubíček, Vojtěch Kovář, Jan Michelfeit, Pavel Rychlý, and Vít Suchomel. 2014. "The Sketch Engine: Ten Years On." *Lexicography* 1 (1): 7–36.
- Kinnunen, Tuija, and Kaisa Koskinen, eds. 2010. *Translators' Agency*. Tampere: Tampere University Press.
- Landis, J. Richard, and Gary G. Koch. 1977. "The Measurement of Observer Agreement for Categorical Data." *Biometrics* 33 (1): 159–174.
- Läubli, Samuel and Orrego-Carmona, David. 2017. "When Google Translate is Better Than Some Human Colleagues, Those People Are no Longer Colleagues." In *Proceedings of the 39th Conference Translating and the Computer*, 59–69.
- LeBlanc, Matthieu. 2017. "I Can't Get no Satisfaction! – Should We Blame Translation Technologies or Shifting Business Practices?" In *Human Issues in Translation Technology*, edited by Dorothy Kenny, 45–62. London: Routledge.
- Lionbridge. 2017. "Transcreation Services." Lionbridge. Accessed December 4, 2017. <https://www.lionbridge.com/en-us/global-marketing-services/transcreation-services>.
- Lumeras, Maite Aragonés, and Andy Way. 2017. "On the Complementarity between Human Translators and Machine Translation." *Hermes – Journal of Language and Communication in Business* 56: 21–42.
- Massardo, Isabella, and Jaap van der Meer. 2017. *The Translation Industry in 2022: A Report from the TAUS Industry Summit*. Translation Automation User Society. Accessed December 4, 2017. <https://www.taus.net/think-tank/reports/event-reports/the-translation-industry-in-2022>.
- McDonough Dolmaya, Julie. 2011a. "A Window into the Profession." *The Translator* 17 (1): 77–104.
- McDonough Dolmaya, Julie. 2011b. "Moral Ambiguity: Some Shortcomings of Professional Codes of Ethics for Translators." *The Journal of Specialised Translation* 15: 28–49.
- Meijer, Siety. 1993. "Attitudes Towards Machine Translation." *Language International* 5 (6): 11–13.
- Mitchell, Christine, and Rita Raley, eds. 2018. "Translation-Machination" special issue, *Amodern* 8. Accessed March 27, 2018. <http://amodern.net/article/amodern-8-translation-machination/>.
- Mokyr, Joel, Chris Vickers, and Nicolas L Ziebarth. 2015. "The History of Technological Anxiety and the Future of Economic Growth: Is This Time Different?" *The Journal of Economic Perspectives* 29 (3): 31–50.
- Moorkens, Joss. 2017. "Under Pressure: Translation in Times of Austerity." *Perspectives* 25 (3): 464–477.
- Nida, Eugene. (1964) 2000. "Principles of Correspondence." In *The Translation Studies Reader*, edited by Lawrence Venuti, 126–140. London and New York: Routledge.
- Nord, Christiane. 2014. *Translating as a Purposeful Activity: Functionalist Approaches Explained*. London and New York: Routledge.
- O*NET. 2016. *Summary Report for: 27-3091.00 – Interpreters and Translators*. National Center for O*NET Development. Accessed December 4, 2017. <https://www.onetonline.org/link/summary/27-3091.00>.
- O*NET. 2017. *O*NET Online*. National Center for O*NET Development. Accessed December 4, 2017. <https://www.onetonline.org/>.
- OECD. 2017. *OECD Employment Outlook 2017*. Paris: OECD Publishing.
- OECD.Stat. 2017. *Consumer Prices*. Organisation for Economic Co-operation and Development. Accessed August 2, 2017. <http://stats.oecd.org/index.aspx?querytype=view&queryname=221#>.
- Olohan, Maeve. 2011. "Translators and Translation Technology: The Dance of Agency." *Translation Studies* 4 (3): 342–357.
- ONS. 2017. *Earnings and Working Hours*. Office for National Statistics. Accessed December 4, 2017. <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/industry4digitsic2007ashetable16>.

- Pedersen, Daniel. 2014. "Exploring the Concept of Transcreation – Transcreation as More Than Translation." *Cultus: The Journal of Intercultural Mediation and Communication* 7: 57–71.
- Pym, Anthony. 2004. *The Moving Text: Localization, Translation and Distribution*. Amsterdam: John Benjamins.
- Risku, Hanna, Theresa Pichler, and Vanessa Wieser. 2017. "Transcreation as a Translation Service: Process Requirements and Client Expectations." *Across Languages and Cultures* 18 (1): 53–77.
- Rogers, Kate. 2017. "As the Earth Feels ever Smaller, Demand for Translators and Interpreters Skyrockets." *CNBC*, July 7. <https://www.cnn.com/2017/07/07/as-the-earth-feels-ever-smaller-demand-for-translators-and-interpreters-skyrockets.html>.
- Ross, Alec. 2016. "The Language Barrier Is About to Fall. Within 10 years, Earpieces will Whisper Nearly Simultaneous Translations – And Help Knit the World Closer Together." *The Wall Street Journal*, January 29. <https://www.wsj.com/articles/the-language-barrier-is-about-to-fall-1454077968>.
- Salvatori, Andrea. 2015. *The Anatomy of Job Polarisation in the UK*. IZA Discussion Paper No. 9193. Accessed March 23, 2018. <http://ftp.iza.org/dp9193.pdf>.
- SFT. 2015. *Enquête 2015 sur les pratiques professionnelles des métiers de la traduction*. Société Française des Traducteurs. Accessed March 19, 2018. https://www.sft.fr/clients/sft/telechargements/file_front/45866_2015_RESULTATS_PRELIMINAIRES.pdf.pdf.
- TranslatorsCafé. 2017. "Real Time Site Statistics." *TranslatorsCafé*. Accessed December 4, 2017. <https://www.translatorscafe.com/cafe/EN/Stats.asp>.